Patent claims

We claim:

1. A temperature compensated actuator device comprising:
- a piezoelectric stack having first and second ends along a central axis and having a first thermal expansion coefficient;
- a compensator arranged on one end of the piezoelectric stack comprising:
  - a first member in form of a cylinder;
  - a second member in form of a piston plate wherein the first member and the second member are arranged movably along said axis with respect to each other and define a hollow space between them; and
  - a compensation member having a thermal expansion coefficient higher than the first thermal expansion coefficient for filling said hollow space.

2. The actuator device as in claim 1, further comprising a top plate and a bottom plate in between which said piezoelectric stack and said compensator are arranged.

3. The actuator device as in claim 2, wherein said top plate comprises at least one opening through which said piezoelectric stack can be electrically contacted.

4. The actuator device as in claim 1, wherein said piezoelectric stack comprises a plurality of piezoelectric elements.

5. The actuator device as in claim 1, wherein said first member is a cup shaped cylinder having an opening and said second member is a plate having an elevated section which fits within said opening.

6. The actuator device as in claim 2, further comprising a tube spring coupling said top and bottom plate for preloading said compensator.

7. The actuator device as in claim 6, wherein said tube spring is made of metal.

8. The actuator device as in claim 7, wherein the metal has a thermal coefficient of about $11{,}5x10^{-6}/K$.

9. The actuator device as in claim 1, wherein the first member comprises an inner cavity and an opening, wherein a piston plate of said second member is movably arranged within said cavity through said opening to define said hollow space.

10. The actuator device as in claim 9, further comprising a spring arranged within said cavity between said piston plate and said opening.

11. The actuator device as in claim 9, wherein the first member comprises two parts which can be coupled via a connecting thread.

12. The actuator device as in claim 9, wherein the second member comprises two parts which can be coupled via a connecting thread.

13. The actuator device as in claim 1, wherein the compensation member is made of plastic having a high thermal expansion coefficient.

14. The actuator device as in claim 13, wherein the thermal coefficient is about $100x10^{-6}/K$.

15. The actuator device as in claim 1, wherein the first and second member are made of metal.

16. The actuator device as in claim 15, wherein the metal has a thermal coefficient of about $11{,}5x10^{-6}/K$.

17. A fuel injector valve comprising:

- a body having an inner cavity for receiving a piezoelectric actuator, wherein the cavity comprises an opening which forms a control valve by means of a valve member which can be actuated by said piezoelectric actuator, wherein the piezoelectric actuator device comprises:
  - a piezoelectric stack having first and second ends along a central axis and having a first thermal expansion coefficient;
  - a compensator arranged on one end of the piezoelectric stack comprising:
    - a first member in form of a cylinder;
    - a second member in form of a piston plate wherein the first member and the second member are arranged movably along said axis with respect to each other and define a hollow space between them; and
    - a compensation member having a thermal expansion coefficient higher than the first thermal expansion coefficient for filling said hollow space.

18. The fuel injector valve as in claim 17, further comprising a top plate and a bottom plate in between which said piezoelectric stack and said compensator are arranged.

19. The fuel injector valve as in claim 18, wherein said top plate comprises at least one opening through which said piezoelectric stack can be electrically contacted.

20. The fuel injector valve as in claim 17, wherein said piezoelectric stack comprises a plurality of piezoelectric elements.

21. The fuel injector valve as in claim 17, wherein said first member is a cup shaped cylinder having an opening and said second member is a plate having an elevated section which fits within said opening.

22. The fuel injector valve as in claim 18, further comprising a tube spring coupling said top and bottom plate for preloading said compensator.

23. The fuel injector valve as in claim 22, wherein said tube spring is made of metal.

24. The fuel injector valve as in claim 23, wherein the metal has a thermal coefficient of about $11{,}5x10^{-6}/K$.

25. The fuel injector valve as in claim 17, wherein the first member comprises an inner cavity and an opening, wherein a piston plate of said second member is movably arranged within said cavity through said opening to define said hollow space.

26. The fuel injector valve as in claim 25, further comprising a spring arranged within said cavity between said piston plate and said opening.

27. The fuel injector valve as in claim 25, wherein the first member comprises two parts which can be coupled via a connecting thread.

28. The fuel injector valve as in claim 25, wherein the second member comprises two parts which can be coupled via a connecting thread.

29. The fuel injector valve as in claim 17, wherein the compensation member is made of plastic having a high thermal expansion coefficient.

30. The fuel injector valve as in claim 29, wherein the thermal coefficient is about $100x10^{-6}/K$.

31. The fuel injector valve as in claim 17, wherein the first and second member are made of metal.

32. The actuator device as in claim 31, wherein the metal has a thermal coefficient of about $11{,}5x10^{-6}/K$.